

AMENDMENTS TO THE CLAIMS

Cancel claims 1-14 and 29-31 without prejudice. Please accept amended claim 15 and new claims 32-34 as follows:

1-14. (Cancelled)

15. (Currently Amended) A method of forming a connection device that connects layers of integrated circuits, comprising:

forming a first dummy layer over a first metal layer;

forming an actuating layer over the first dummy layer;

forming a second dummy layer over the actuating layer;

forming a second metal layer over the second dummy layer; and

forming a plurality of re-configurable vias, each re-configurable via extending from the first metal layer through each of the first dummy layer, the actuating element and the second dummy layer and ~~between the first metal layer and to~~ the second metal layer.

16. (Original) The method of claim 15, wherein the step of forming a plurality of re-configurable vias comprises a step of forming a plurality of re-configurable phase-change vias.

17. (Original) The method of claim 16, wherein the step of forming an actuating layer comprises forming a resistive heating element.

18. (Original) The method of claim 15, wherein the steps of forming a first dummy layer and a second dummy layer comprise forming a first dielectric layer and a second dielectric layer,

respectively.

19. (Original) The method of claim 17, wherein the step of forming the plurality of re-configurable phase change vias comprises:

forming a plurality of openings through the first dummy layer, the actuating layer and the second dummy layer and between the first metal layer and the second metal layer; and
forming pillars in each of the plurality of openings.

20. (Original) The method of claim 19, wherein the plurality of openings are formed by a self-assembly templating method.

21. (Original) The method of claim 19, wherein the step of forming the pillars in each of the plurality of openings comprises:

forming a phase change material layer over the second dummy layer so as to fill the plurality of openings with phase change material; and
polishing the phase change material layer to be flush with a top surface of the second dummy layer.

22. (Original) The method of claim 21, wherein the phase change material layer is made of $\text{Ge}_2\text{Sb}_2\text{Te}_5$.

23. (Original) The method of claim 21, further comprising:

forming spacers in the plurality of openings before forming a phase change material layer.

24. (Original) The method of claim 17, further comprising:

forming electrical contacts over the resistive heating element; and

forming a programming circuit that provides current to the resistive heating element through the contacts so that the heating element heats up the plurality of re-configurable phase change vias to change the plurality of re-configurable vias between a conductive state and a non-conductive state.

25. (Original) The method of claim 17, wherein the resistive heating element is made of polycrystalline silicon.

26. (Original) The method of claim 15, further comprising:

removing the first dummy layer and the second dummy layer so as to form air gaps between the actuating layer and the first and second metal layers.

27. (Original) The method of claim 26, wherein the step of removing the first and second dummy layers comprises:

forming a plurality of tap holes in the first dummy layer, the actuating layer and the second dummy layer; and

etching the first dummy layer and the second dummy layer through the plurality of tap holes to form an air gap between the actuating layer and the first and second metal layers.

28. (Original) The method of claim 26, further comprising:

forming a dielectric layer over the plurality of tap holes to seal the plurality of tap holes.

29-31. (Cancelled)

32. (New) A method of forming a connection device that connects layers of integrated circuits, comprising:

forming a first dummy layer over a first metal layer;

forming an actuating layer over the first dummy layer;

forming a second dummy layer over the actuating layer;

forming a second metal layer over the second dummy layer;

forming a plurality of re-configurable vias through the first dummy layer, the actuating element and the second dummy layer and between the first metal layer and the second metal layer; and

removing the first dummy layer and the second dummy layer so as to form air gaps between the actuating layer and the first and second metal layers.

33. (New) The method of claim 32, wherein the step of removing the first and second dummy layers comprises:

forming a plurality of tap holes in the first dummy layer, the actuating layer and the second dummy layer; and

etching the first dummy layer and the second dummy layer through the plurality of tap holes to form an air gap between the actuating layer and the first and second metal layers.

34. (New) The method of claim 32, further comprising:

forming a dielectric layer over the plurality of tap holes to seal the plurality of tap holes.